

BIOLOGICAL EVALUATION
Spruce Budworm Infestations
Egg Mass Sampling
1962

Carson and Santa Fe National Forests
and Adjacent Private Lands

D. T. Jennings

The 1962 spruce budworm egg mass survey data for 920,000 acres is presented in two parts. This fourth annual report summarizes the data for 820,000 acres of National Forest, Indian, State, and private land in northern New Mexico. Because of ownership and geographic location, a separate report presents the data for 100,000 acres located on the Navajo Indian Reservation in western New Mexico.

The survey started on August 13 and was completed August 30. Egg masses were collected and counted from 13 plots scattered throughout 820,000 acres of infested type in northern New Mexico. Data collected during the survey supplement aerial and ground observations for reporting budworm conditions and the population trend.

In general, egg mass densities have decreased from last year on most of the plots sampled. However, the potential defoliating population, represented by the current egg mass densities, remains at such a level that continued moderate to heavy defoliation of new growth is expected in 1963. Egg parasitism decreased from 13 percent last year to only 4 percent of the new masses sampled this year. Direct control measures are recommended to suppress the infestation and prevent further damage to the host type.

Acreages infested by the spruce budworm in Region 3 as detected by aerial and ground surveys since 1956 are as follows:

1956	35,520	1960	697,760
1957	62,620	1961	1,029,780 ^{1/}
1958	205,120	1962	920,000
1959	619,920		
<u>1/</u> 444,910 acres treated in 1962			

Technical Information

Insect: Spruce budworm Choristoneura fumiferana (Clem.)

Host Trees: Douglas-fir, Pseudotsuga menziesii; white fir, Abies concolor; corkbark fir, Abies arizonica; blue spruce, Picea pungens; and Engelmann spruce, Picea engelmanni. In New Mexico, damage is more prevalent on Douglas-fir and true firs.

Type of Damage: Varying degrees of damage are exhibited by the infestation. Light (2%) to heavy (87%) current defoliation was observed on the

plots. The average percent current defoliation for these plots was 41.9. Because of accumulated damage, most of the area was classified as having moderate to heavy defoliation during the aerial survey.

Extent and Location of Infestation: The infestation extends throughout 820,000 acres of host type on National Forest, Indian, State, and private lands (see map). Table 1 lists the acreage of spruce budworm infestations in northern New Mexico by degrees of defoliation. These acreages were determined by aerial and ground surveys in 1962.

Biological Data

Sampling Methods: The same plots and, in most cases, the same trees were used to sample egg mass density in 1962 as in 1961. One additional new plot was established in the San Pedro Wild Area. Six of the 13 plots sampled were located on the Western Division of the Carson National Forest and adjacent private lands. The remaining seven plots were located on the Western Division of the Santa Fe National Forest and adjacent private lands.

Each plot consisted of five dominant or co-dominant Douglas-fir trees. Two men, using a 20-foot aluminum ladder and pruning saw, sampled infested trees by removing two lower, mid-crown branches. Foliage on one side of each branch was clipped off and discarded. The remaining foliage was then measured, clipped, and placed in numbered burlap bags. Thus, the equivalent of one entire branch per tree or five entire branches per plot were sampled.

All foliage samples were examined for egg masses by four female biological aids at Santa Fe, New Mexico. Needles with egg masses or similar foreign material were removed from the branches and placed in small pill boxes. An entomologist then examined this material and separated budworm egg masses from the extraneous material. The egg masses were then segregated with the aid of a microscope into two classes: parasitized and unparasitized. Parasitized and unparasitized egg masses were differentiated in the following way: Egg masses with 50 percent or more of the eggs parasitized were classified parasitized; masses with less than 50 percent of the eggs parasitized were considered unparasitized. The sampled data is summarized in Table 2.

Table 1

Acreage of Spruce Budworm Infestation in Northern New Mexico by Degrees
of Defoliation, 1962

Location	Degree of Defoliation				Ownership	
	Light	Moder- ate	Heavy	Very Heavy	Federal	Private
<u>Carson N.F., Western Division and Adjacent Private Lands</u>						
Forest Service	91,000	75,500	67,500	2,500	236,500	
Tierra Amarilla Grant	3,300	4,300	52,500	12,100		72,200
<u>Santa Fe N.F. Western Division and Adjacent Private Lands</u>						
Forest Service	109,600	103,800	18,900		232,300	
Baca Location	42,000	36,000	6,000			84,000
Cañon De San Diego	34,200					34,200
<u>Indian Lands</u>						
Jemez Springs Ind. Res.	3,000				3,000	
Cochiti Ind. Res.		1,100	1,000		2,100	
Santa Clara Ind. Res.	600	1,500			2,100	
<u>Non-Federal Lands</u>						
<u>Eastern Division</u>						
State & Private	30,000	55,300	60,300	8,000		153,600
Total	313,700	277,500	206,200	22,600	476,000	344,000
						Grand Total 820,000

Table 2

Summary of Spruce Budworm Egg Mass Counts from Thirteen Douglas-fir Plots on National Forest and Adjacent Private Lands in Northern New Mexico, 1962

Plot Location	Sq. in. of Foliage Examined	New egg masses per 1,000 sq. in. foliage, 1962	
		Unpara.	Para.
<u>Carson N.F., Western Division and Adjacent Private Lands</u>			
Lobo Lodge	5,384	32.7	3.1
Brazos	5,345	20.9	0.7
Willow Creek	8,631	28.5	0.6
Canones Creek	7,913	9.3	2.0
Broke Off Mt.	8,513	18.9	0.1
Rio Nutritas	<u>6,417</u>	<u>12.7</u>	<u>1.4</u>
Subtotal	42,203	123.0	7.9
Subaverage	7,033	20.5	1.3
<u>Santa Fe N.F. Western Division and Adjacent Private Lands</u>			
Paliza Canyon	6,041	7.6	0.0
Del Norte Canyon	5,827	3.6	0.0
Clear Creek	7,024	1.3	0.0
Bluebird Mesa	6,391	1.8	0.0
San Pedro Mt.	6,974	29.4	0.0
Red Top	9,417	42.6	1.9
San Pedro Wild Area ^{1/}	<u>4,541</u>	<u>32.3</u>	<u>0.0</u>
Subtotal	46,215	118.6	1.9
Subaverage	6,602	16.9	0.3
Total	88,418	241.6	9.8
Average	6,801	18.5	0.7

^{1/} New plot established 8/23/62

Results

Egg Mass Densities: A total of 88,418 square inches of Douglas-fir foliage was collected, measured, and examined for budworm egg masses in 1962 (Table 2). An average of 6,801 square inches of foliage was collected per sampled plot. New unparasitized egg masses averaged 18.5 per 1,000 square inches of foliage for the 13 plots sampled.

On the Carson National Forest and adjacent private lands, six plots averaged 20.5 masses. On the Santa Fe National Forest and adjacent private lands, seven plots averaged 16.9 masses.

Table 3 summarizes the average number of new, unparasitized egg masses for these entomological units from 1959-62.

Egg Parasitism: New, parasitized egg masses per 1,000 square inches of foliage averaged 1.3 and 0.3 on the Carson and Santa Fe National Forests, respectively.

Table 3

Summary of New, Unparasitized Egg Masses by Entomological Units for 1959, 1960, 1961, and 1962

Entomological Unit	Average Number of New, Unparasitized Egg Masses per 1,000 Square Inches of Foliage			
	1959	1960	1961	1962
<u>Carson N.F., Western Division and Adjacent Private Lands</u>	18.4	35.3	37.2	20.5
<u>Santa Fe N.F., Western Division and Adjacent Private Lands</u>	27.7	21.4	15.2	16.9

Conclusions

The relationship between egg mass densities and defoliation has been used as a basis for predicting the population trend of spruce budworm in other western regions.^{1/} It is not known whether this relationship exists for budworm populations in Arizona and New Mexico. In previous years, the correlation between egg mass densities and resulting defoliation has been erratic. For instance, in 1961 an egg mass density of 25.0 masses per 1,000 square inches of foliage on one plot resulted in 39.4 percent defoliation in 1962. On another plot, 4.4 masses per 1,000 square inches of foliage in 1961 resulted in 27.4 percent defoliation in 1962. From these examples it appears that a low egg mass density one year may produce almost as much defoliation the next year as a higher egg mass density. Thus, extensive defoliation has occurred in previous years when egg mass densities were lower than the average densities encountered this year on the two entomological units sampled. On this basis, continued moderate to heavy defoliation of host type is expected in 1963 on the Carson and Santa Fe National Forests and adjacent private lands.

Many of the infested stands are of low vigor due to the cumulative effect of annual budworm feeding. Top-killing, increment loss, and tree mortality are expected to continue unless direct control measures are undertaken to suppress the infestation.

^{1/} V. M. Carolin and W. K. Coulter. 1959. Research Findings Relative to the Biological Evaluation of Spruce Budworm Infestations in Oregon. Unpublished.

T. T. Terrell. 1962. Spruce Budworm Infestations in the Northern Region. 1961. Unpublished.